XXIII. *Experiments and Obſervations on the* Terra Ponderoſa, &c. *By* William Withering, *M. D.*; *communicated by* Richard Kirwan, *Eſq. F. R. S.*

Read April 22, 1784.

SECTION I.

Terra ponderoſa aërata.

THIS ſubſtance was got out of a lead-mine at Alſton-Moor, in Cumberland. I firſt ſaw it in the valuable collection of my worthy and ingenious friend MATTHEW BOULTON, Eſq. at Soho; who, when he picked it up, conjectured from its weight that it contained ſomething metallic. About two years ago I ſaw it in his poſſeſſion; and partly from its appearance, being different from that of any calcareous ſpar I had ſeen, and partly from its great weight, I ſuſpected it to be the ſpatum ponderoſum.

A few experiments made at the moment confirmed my ſuſpicions, at leaſt ſo far as to ſhew that it contained a large proportion of the terra ponderoſa united to fixed air; but I did not then flatter myſelf that it would prove ſo pure as I afterwards found it to be.

Profeſſor BERGMAN, in his Sciagraphia Regni Mineralis, publiſhed laſt year at Leipſic, conjectures (§ 58.), with his uſual ſagacity, "Terra ponderoſa *nitrata* forte alicubi nativa "occurrit, a nemine tamen adhuc inventa, quod etiam valet "de *aërata*."

I was much delighted by the detection of a ſubſtance which promiſes to be of very conſiderable utility in chemical inquiries, and more ſo when I found it to be a native of this country; for it is not improbable, that it may be met with in many other mines, beſides that at Alſton-Moor.

Mr. BOULTON, with his uſual benevolence, preſented me with a piece of it, part of which accompanies this paper, for the inſpection of the Members of the Royal Society.

More obvious Properties.

Its general appearance is not much unlike that of a lump of alum; but, upon cloſer inſpection, it ſeems to be compoſed of ſlender ſpiculæ in cloſe contact, but more or leſs diverging. It may be cut with a knife. Its ſpecific gravity is from 4,300 to 4,338.

It effervеſces with acids, and melts under the blow-pipe, though not very readily. Placed in a covered crucible, in a hot parlour fire, it loſt its tranſparency.

After expoſure to a moderate heat in a melting furnace, it adhered to the crucible, and exhibited ſigns of fuſion; but was not diminiſhed in weight, did not feel cauſtic when applied to the tongue, nor had it loſt its property of effervеſcing with acids.

Hence it is probable, that its loſs of tranſparency was rather occaſioned by numerous ſmall cracks, than by any eſcape of the water of cryſtallization, or of its aërial acid.

EXPERIMENTS.

A. 500 grains, diſſolved in muriatic acid, in ſuch a manner that nothing but elaſtic fluid could eſcape, loſt in ſolution 104 grains, and there remained an inſoluble reſiduum of nearly 3 grains.

2. In another experiment 100 grains loſt in ſolution 21 grains, and there remained 0,6 of a grain of inſoluble matter.

B. 100 grains diſſolving in dilute muriatic acid, gave out 25 ounce meaſures of air. This air was received in quickſilver, and when the ſpar was wholly diſſolved, the ſolution was boiled, in order to drive out what air might be lodged in it.

2. This air was heavier than atmoſpheric air; it was readily abſorbed by agitation in water, it precipitated lime from lime-water, and it extinguiſhed flame. The water which had abſorbed it changed the blue colour of litmus ſlowly * to a red; ſo that this elaſtic fluid was undoubtedly fixed air.

C. The ſolution (B) by the addition of mild foſſil fixed alkaly, afforded a precipitate which, after proper waſhing and drying, weighed 100 grains.

2. This precipitate, upon being again diſſolved in marine acid, yielded only 20 ounce meaſures of fixed air.

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* Other acids turn the blue of litmus inſtantly to a red, whilſt water, impregnated with fixed air, does not change the litmus immediately; but, after ſome ſeconds, the red colour begins to appear, and then gradually grows more diſtinct.

D. To a ſaturated ſolution in marine acid mild fixed vegetable alkaly was added; the earth was precipitated, and a quantity of fixed air eſcaped.

2. The ſame thing happened when mild foſſil alkaly was added.

3. When cauſtic vegetable alkaly was uſed, the precipitation took place, but without any appearance of effervеſcence.

4. 50 parts diſſolved in marine acid loſt, during the ſolution, nearly 10,5. This ſolution, upon the addition of cauſtic vegetable alkaly, let fall a precipitate which, when waſhed and dried, weighed 45,5.

5. Phlogiſticated alkaly precipitated the whole of the earth from part of the ſolution D; for mild fixed alkaly afterwards added to the filtered liquor occaſioned no further precipitation.

E. Part of the precipitates D. 1. 2. after expoſure to a ſtrong heat in a crucible, was thrown into water. Next morning the water was completely covered with an ice-like cruſt, and had the acrid taſte of lime-water in a very high degree.

2. The ſmalleſt portion of vitriolic acid added to this water occaſioned an immediate and copious precipitation; and when this acrid water was diluted with 200 times its bulk of pure water, the precipitation upon the addition of vitriolic acid was yet ſufficiently obvious.

3. A ſingle drop of this acrid water, added to ſolutions of tartar of vitriol, GLAUBER's ſalt, vitriolic ammoniac, alum, Epſom ſalt, ſelenite, occaſioned an immediate precipitation in all of them.

F. The precipitate thrown down by the cauſtic vegetable alkaly (D. 3.) was put into water, in expectation that it would make lime-water; but neither upon ſtanding, nor after boiling, did this water exhibit any precipitation when concentrated vitriolic acid was dropped in it; nor had it any acrimonious or other peculiar taſte.

G. Concentrated vitriolic acid was added to one portion of the precipitate D. 3; concentrated nitrous acid to a ſecond portion; and marine acid to a third portion. No efferveſcence could be obſerved, nor was there any appearance of ſolution. After ſtanding one hour water was added; and the acids, thus diluted, were ſuffered to remain upon the portions of the precipitate for another hour. They were then decanted, and ſaturated with mild foſſil fixed alkaly, but without any appearance of precipitation.

H. The part precipitated by the phlogiſticated alkaly, when mixed with nitre and borax, and fluxed by a blow-pipe upon charcoal, formed a black glaſs; upon flint-glaſs, a white; and upon a tobacco-pipe an opaque yellowiſh white one.

2. Another portion melted with ſoap and borax in a crucible, formed a black glaſs, but without any metallic appearance.

I. The inſoluble reſiduum (A.) was boiled in water, the water decanted, and mild fixed alkaly added, but without any ſubſequent precipitation.

2. This inſoluble powder was not attacked by the nitrous or marine acids; but being put into vitriolic acid, and boiled a conſiderable time until the acid became highly concentrated, it diſſolved entirely, and ſeparated again upon the addition of water. It will appear in the ſequel, that the ſame thing happens to marmor metallicum, when diſſolved by boiling in the acid of vitriol.

CONCLUSIONS.

Hence it appears, that 100 parts of this ſpar contain

Terra ponderoſa pura -	78,6
Marmor metallicum -	,6
Fixed air - - -	20,8
	100

OBSERVATIONS.

1ſt, The quantity of mild fixed alkaly neceſſary to ſaturate an acid, previouſly united to the terra ponderoſa, contains more fixed air than is neceſſary to ſaturate that quantity of terra ponderoſa D. 1. 2.

2dly, The terra ponderoſa, when precipitated from an acid by means of a mild fixed alkaly (D. 1. 2.), readily burns to lime; and this lime-water proves a very nice teſt of the preſence of vitriolic acid. E. 2. 3.

3dly, It is very remarkable, that the terra ponderoſa ſpar, in its native ſtate, will not burn to lime. In the lower degrees of heat it ſuffers no change, as was before obſerved, beſides the loſs of its tranſparency. When urged with a ſtronger fire, it melts and unites to the crucible, but does not become cauſtic.

I buried it in charcoal-duſt in a covered crucible, and then expoſed it to a pretty ſtrong heat; but it did not part with its air.

May we not conjecture, then, that as cauſtic lime cannot unite to fixed air without the intervention of moiſture, and as this ſpar ſeems to contain no water in its compoſition, that it is the want of water which prevents the fixed air aſſuming its elaſtic aërial ſtate? This ſuppoſition becomes ſtill more probable, if we obſerve that when the ſolution of the ſpar in an acid is precipitated by a mild alkaly, C. 1. 2. ſome water enters into the compoſition of the precipitate, for it weighs the ſame as before it was diſſolved, and yet contains only 20 ounce meaſures of fixed air, whilſt the native ſpar contained 25 ounce meaſures; ſo that there is an addition of weight equal to that of 5 ounce meaſures of fixable air, or 3¼ grains to be accounted for, which can only ariſe from the water; and this precipitate, thus united to water, readily loſes its aërial acid in the fire, E. 1.

4thly, Profeſſor BERGMAN ſuppoſes the terra ponderoſa to be a metallic earth*; its entire ſeparation from an acid by means of the phlogiſticated alkaly (D. 5.) certainly favours ſuch a ſuppoſition; but, if it be ſo, it is evident from experiments H. 1. 2. that other means than thoſe commonly employed muſt be uſed to effect its reduction.

5thly, The precipitate made by the cauſtic vegetable alkaly D. 4. taking ſome of the alkaly down with it, and thus forming a ſubſtance neither ſoluble in water nor in acids, is a very curious phænomenon.

I afterwards varied the experiment by adding the terra ponderoſa lime-water (E.) to cauſtic vegetable and cauſtic foſſil alkaly. In both caſes this inſoluble compound was immediately formed; but not ſo when cauſtic volatile alkaly was uſed. This compoſition of an alkaly and an earth certainly deſerves more attention than I am at preſent able to beſtow upon it.

6thly, As it appears from experiments D. 1. 2. 3. 4. that fixed alkalies, both mild and cauſtic, ſeparated the terra ponderoſa from marine acid, I was at a loſs to know why Profeſſor BERGMAN, in his admirable table of ſimple elective attractions, placed the terra ponderoſa cauſtica immediately under the vitriolic, nitrous, and marine acids; and conſequently above the cauſtic alkalies. I was intereſted in the reality of the facts, becauſe I had ſo ſeldom ſeen reaſon to doubt the obſervations of that very excellent chemiſt; and therefore made the following experiments.

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* See preface to his Sciagraphia Regni Mineralis.

To different portions of terra ponderoſa ſalita and terra ponderoſa nitrata I added, drop by drop, cauſtic vegetable, cauſtic foſſil, and cauſtic volatile alkalies. In every caſe the EARTH was thrown down; and I have ſo often repeated theſe experiments to ſatisfy myſelf and others, that I am perſuaded the terra ponderoſa cauſtica ought to be placed below the alkalies, except in the column appropriated to the vitriolic acid; and it may be ſeparated even from that acid, by the vegetable fixed alkaly, if the alkaly be applied *via ſicca*, as will appear in the next ſection.

7thly, The neceſſity for uſing pure acids upon many occaſions, and the difficulty of obtaining them pure, are ſufficiently obvious. The VITRIOLIC ACID, as made in the large way, is generally pure enough for moſt purpoſes. It is apt to get coloured by inflammable matter; but this is ſeldom an inconvenience; and, when it would be ſo, it is eaſy to drive it off by boiling the acid in a Florence flaſk over a common fire. But there is another cauſe of impurity in this acid, which appears upon diluting it with water; for then it becomes milky, and in a ſhort time a powder ſubſides *.

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* About two years ago I examined this powdery matter; both that which was thrown

The acid may be freed from this powder either by diſtillation in glaſs veſſels, which is a tedious and dangerous proceſs, or by the affuſion of water; and, after the powder has ſubſided, a gentle evaporation will drive off moſt of the ſuperfluous water.

NITROUS ACID may be freed from vitriolic and marine acids, by ſolution of ſilver in the acid of nitre, as is daily practiſed; but the MARINE ACID has not, to my knowledge, been purified by any other method than the laborious one of re-diſtilling it from common ſalt. It is generally mixed with vitriolic acid; and often in large proportion. There is no temptation, and ſcarcely an opportunity, for it to be contaminated by nitrous acid. From the vitriolic acid then it may be readily purified by the addition of terra ponderoſa cauſtica diſſolved in water, or by the terra ponderoſa ſalita. If the latter be uſed, a ſmall

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thrown down by dilution with water, and alſo ſome which Dr. PRIESTLEY gave me, being the reſiduum of vitriolic acid diſtilled to dryneſs in a flint-glaſs retort.

1ſt, Repeated boiling in water, reduced 6½ grains to 2 grains.

2dly, This ſolution, by gentle evaporation, afforded 5 grains of cryſtals, as hard and as taſteleſs as ſelenite.

3dly, To theſe cryſtals, re-diſſolved in water, mild foſſil alkaly was added, and a white powder precipitated.

4thly, This powder, after expoſure to a pretty ſharp heat, was thrown into water; part of it diſſolved, and the water got the taſte and other properties of lime-water.

5thly, The inſoluble part (1.) ſuffered no change by boiling in nitrous acid; one-half of it mixed with borax, and expoſed to the blow-pipe upon charcoal, vitrified; the other half, mixed with borax and charcoal-duſt, likewiſe vitrified.

CONCLUSIONS. It appears, then, that the greater part of this ſubſtance was calx vitriolata, or ſelenite; the remainder a vitrifiable earth.

I had before found, that the terra ponderoſa vitriolata, or heavy gypſum, would diſſolve in concentrated vitriolic acid; but always ſeparated in a powdery form upon the affuſion of water; and now it appears, that calx vitriolata, or ſelenite, does the ſame.

portion of the acid muſt firſt be tried in a diluted ſtate, from whence we muſt judge how much of the terra ponderoſa ſalita the whole will require; or elſe the whole of the acid muſt be diluted with water. Whether we uſe the terra ponderoſa diſſolved in water or in marine acid; in either caſe the acid of vitriol immediately ſeizes upon it, and ſubſides with it in form of an inſoluble powder.

As there are reaſons for preferring the marine acid in ſeveral of the nicer and more important enquiries of chemiſtry, this ready method of purifying it cannot but prove acceptable.

SECTION II.

Terra ponderoſa vitriolata. **BERGMAN's** Sciagraphia, §§ 58. 89.
Variety, Heavy Gypſum. Ponderous Spar.
Marmor Metallicum. **CRONSTEDT** Min. § 18. 2. 19. C.

From Kilpatrick-hills near Glaſgow. A ſort, with ſmaller cryſtals, amongſt the iron ore about Ketley in Shropſhire. In the lead mines at Alſton-Moor.

More obvious Properties.

White; nearly tranſparent, but has not the property of double refraction; compoſed of laminæ of rhomboidal cryſtals; decrepitates in the fire. Specific gravity from 4,402 to 4,440.

EXPERIMENTS.

A. 100 grains expoſed to a red heat for one hour, in a black lead crucible, loſt five grains in weight; but as a ſulphureous ſmell was perceptible, I ſuſpected that a decompoſition had taken place, and therefore expoſed another portion to a ſimilar heat for the ſame ſpace of time in a tobacco-pipe. This had no ſmell of ſulphur, nor was it diminiſhed in weight.

2. It is barely fuſible under the blow-pipe; but with borax fluxes readily into a white opake glaſs.

B. 100 grains, ground in a mortar, and waſhed over extremely fine by repeated additions of water, were boiled in the ſame water, and, after ſettling, the water was poured off. The powder, when dried, had not ſenſibly loſt weight.

2. To ſeparate portions of the waſhing water, were added mild vegetable and mild foſſil alkaly; but without any appearance of precipitation. Nitre of mercury gave a very ſlight browniſh cloud, barely diſcernible; and nitre of ſilver an extremely ſlight bluiſh appearance.

3. The ſame powder, boiled again in freſh water, did not affect the water at all; for it ſtood the teſt of nitre of ſilver without any change.

C. Portions of the powder B. were boiled in vitriolic, nitrous, and muriatic acids, of the uſual ſtrength, for ſeveral minutes. The acids were then ſaturated with vegetable fixed alkaly, but without any appearance of precipitation, nor had the portions of powder loſt any weight.

2. But when boiled in vitriolic acid, until that acid became very much concentrated and nearly red-hot, the whole of it diſſolved; but, ſeparated again upon the addition of water, was

not altered in its weight, was not acted upon by acids of the uſual ſtrength, and had, under the blow-pipe, the properties mentioned at A. 2.

3. Some of the ſolution in the concentrated vitriolic acid was left expoſed to the atmoſphere, that the acid might ſlowly attract water. After ſome days, beautiful cryſtals appeared in the ſhapes of ſtars, faſciæ, and other radiated forms.

4. To another portion of this ſolution mild fixed vegetable alkaly was added; but the precipitate appeared to be the marmor metallicum unchanged.

D. One ounce of this marmor metallicum in fine powder was fluxed in a crucible with two ounces of ſalt of tartar, until it ran thin. This ſubſtance, boiled with water in a Florence flaſk, left a reſiduum of ſix drams.

E. This reſiduum was thrown into water, and pure nitrous acid added, until there was no more effervеſcence. The undiſſolved part weighed 52 grains.

F. This undiſſolved part appeared to be the original ſubſtance no ways changed; for it did not diſſolve in nitrous or marine acids, but did wholly diſſolve in the greatly concentrated and boiling vitriolic acid, from which it was again ſeparated by the addition of water. (C. 2.)

G. The ſolution D. was ſaturated with diſtilled vinegar, and then evaporated to dryneſs, but with leſs than a boiling heat. The ſal diureticus, thus formed, was waſhed away with alcohol. The remaining ſalt weighed 5 drams nearly.

2. This ſalt had the appearance and the taſte of vitriolated tartar; it decrepitated in the fire; roaſted with charcoal-duſt, it formed a hepar ſulphuris; and with muria calcarea gave a precipitation of ſelenite.

H. The ſalt, formed with the nitrous acid (E), ſhot readily into beautiful permanent cryſtals, of a rough bitteriſh taſte.

2. Some of this ſalt was deflagrated with nitre and charcoal, and the alkaly afterwards waſhed away.

3. The reſiduum, being the earth of the marmor metallicum, was very white, burnt to lime, and again formed an inſoluble compound with acid of vitriol.

I. 100 grains of terra ponderoſa aërata were diſſolved in diluted marine acid. Vitriolic acid was dropped into this ſolution, until no more precipitation enſued. The precipitate, after very careful waſhing and drying, was expoſed to a red heat in a covered tobacco-pipe for half an hour: when cool, it weighed 117 grains.

2. 50 grains of terra ponderoſa aërata in a lump were put into diluted vitriolic acid; but the action of the acid upon it was hardly ſenſible, even when made hot.

Marine acid was then added, and after ſome time an effervesſcence appeared. The terra ponderoſa vitriolata, thus formed, after proper waſhing and drying, was expoſed to a red heat for an hour: it then weighed 58,4 grains.

CONCLUSIONS.

1ſt, It appears that the marmor metallicum is compoſed of vitriolic acid and terra ponderoſa, D. E. F. G. H.

2dly, That this compound, though probably ſoluble in water, has ſo little ſolubility as almoſt to eſcape detection by the niceſt chemical teſts, B. 1. 2. 3.

3dly, That it is not ſoluble in acids of the uſual ſtrength; but that it perfectly and entirely diſſolves in highly concentrated vitriolic acid, from which it again ſeparates entire and unchanged upon the affuſion of water, C. 1. 2.

4thly, That it cannot be decompoſed (*via humida*) by mild fixed alkaly, C. 4.

5thly, That it may be decompoſed (*via ſicca*) by the vegetable fixed alkaly, D. E. G. H.

6thly, That it may be decompoſed by inflammable matter, uniting to its acid, and forming ſulphur; but that it cannot be decompoſed by heat alone, A. 1.

7thly, From experiments I. 1. 2. it appears, that 100 parts of this ſubſtance contain

Vitriolic acid pure	-	32,8
Terra ponderoſa pure		67,2
		100.

For the 100 parts of terra ponderoſa aërata made uſe of in the experiment I. 1. would loſe during the ſolution 20,8 of fixed air (§ 1ſt, A.); then, deducting 0,6 for the marmor metallicum contained in the terra ponderoſa aërata (§ 1ſt. A. 1. 2.), there remains 78,6 of pure terra ponderoſa. This, when ſaturated with vitriolic acid, and made perfectly dry, weighed 117; conſequently it had taken 38,4 of vitriolic acid.

OBSERVATIONS.

The apparent inſolubility of terra ponderoſa aërata in the diluted vitriolic acid (I. 2.) can be accounted for by remarking, that the moment the ſurface of the lump was acted upon by the acid, an inſoluble coat of marmor metallicum was formed upon it, which effectually precluded any further operation of the acid.

Profeſſor **Bergman**, in order to obtain the earth from the terra ponderoſa vitriolata, directs the latter to be roaſted with fixed alkaly, and the duſt of charcoal; but I have always done it by charcoal duſt alone, though probably this method may require a greater degree of heat.

It has been remarked, that terra ponderoſa and calx of lead reſemble each other in many reſpects; and I muſt add, that the vitriol of lead diſſolves in the highly concentrated vitriolic acid much in the ſame manner that the marmor metallicum does, and like this too ſeparates upon the affuſion of water; but I never obſerved it diſpoſed to cryſtallize.

The marmor metallicum may probably be uſeful in ſome caſes where a powerful flux is wanted; for I once mixed ſome of it with the black flux, and expoſing it to a pretty ſharp heat, it entirely ran through the crucible. May not, therefore, ſome of the more common varieties of it be uſed advantageouſly as a flux to ſome of the more refractory metallic ores?

SECTION III.

Terra ponderoſa Vitriolata.
Variety, Calk or Cauk.
Marmor Metallicum, **Cronstedt** Min. § 18. B?

Plentiful in the Mines in Derbyſhire.

More obvious Properties.

Of a white or reddiſh colour; cryſtallized in rhomboidal laminæ, but theſe very much intermixed and confuſed. Loſes little or nothing of its weight by being made red-hot. Specific gravity 4,330.

EXPERIMENTS.

A. Ground in a mortar, and waſhed over, the waſhing water, when decanted, gave no precipitation with mild vegetable alkaly; but with nitre of ſilver and nitre of mercury the ſlighteſt cloud imaginable.

B. 100 grains boiled in marine acid weighed, after proper waſhing and drying, 99,5.

C. The acid ſolution B let fall a Pruſſian blue upon the addition of a ſingle drop of phlogiſticated fixed alkaly; and, when ſaturated with mild foſſil alkaly, afforded an ochry-coloured precipitate.

D. This precipitate, collected and waſhed, weighed half a grain. It was roaſted with tallow, and then was wholly attracted by a magnet.

E. A quantity of the cauk, finely powdered, was mixed with charcoal-duſt, and roaſted in a crucible at a white heat, for five hours, freſh charcoal-duſt being occaſionally added. It gave out a ſtrong ſmell of ſulphur.

F. To this roaſted cauk nitrous acid was added, which diſſolved the greater part of it; producing, during the ſolution, ſome effervеſcence, and a ſtrong ſmell of hepar ſulphuris.

G. Some of this ſolution, after proper evaporation, afforded beautiful cryſtals, not deliqueſcent, exactly reſembling thoſe obtained from the marmor metallicum, (§ II. H.).

H. To other portions of the ſolution F, were added fixed vegetable and foſſil alkalies, and likewiſe volatile alkaly, each of which precipitated the earth from the acid.

I. This earth, after expoſure to a white heat for one hour, became cauſtic, and made lime-water, ſimilar in properties to to that mentioned at § Iſt. E.

K. Some of the part not acted upon by the nitrous acid F, diſſolved entirely by boiling in highly concentrated vitriolic acid, and wholly ſeparated again by the affuſion of water. More water was added, and the whole was boiled again; but the filtered liquor gave no ſigns of precipitation upon the moſt liberal addition of mild fixed vegetable alkaly.

CONCLUSIONS.

It appears, therefore, that 100 parts of Derbyſhire cauk contain

Marmor metallicum -	99,5
Calciform iron - -	,5
	100

And it is probable, that the redder pieces contain a little more iron.

SECTION IV.

Terra ponderoſa vitriolata.

Variety, radiated Cauk.

Gypſum cryſtalliſatum capillare. CRONSTEDT Min § 19. B.

From Pennely by the Bog, near Minſterley, in Shropſhire, fifteen miles from Salop, on the road to Montgomery.

More obvious Properties.

Somewhat gloſſy like ſatin; yellowiſh-white, opake; compoſed of ſlender ſpiculæ ſet cloſe together, and pointing from a center.

In ſome pieces there are concentric circles of a ſemi-tranſparent horn like appearance. It is not very brittle; may be ſhaved with a knife; loſes little or nothing of its weight by being made red-hot. Its ſpecific gravity 4,000; but after ſoaking one night in the water 4,200, or more.

EXPERIMENTS.

When treated in the ſame manner that the Derbyſhire cauk was, in the preceding ſection, 100 parts of it appeared to contain

Marmor metallicum	-	97,7
Calciform iron	- -	2,3
		100

Suſpecting that the preſence of ſo ſmall a proportion of iron could hardly occaſion the whole of the apparent differences betwixt the Shropſhire and Derbyſhire cauks and the marmor metallicum; and thinking it not improbable, that they might contain lead; I mixed ſome of them with charcoal-duſt and borax, but could not by means of the blow-pipe produce any metallic appearance, although vitriol of lead, treated in the ſame manner, was readily reduced.

I then mixed four parts of cauk with one part of vitriol of lead; the lead could ſtill be reduced, though not ſo readily as before.

GENERAL

GENERAL OBSERVATIONS.

The terra ponderoſa ſeems to claim a place betwixt the earths and the metallic calces. Like the former, it cannot be made to aſſume a metallic form; but, like the latter, it may be precipitated from an acid, by means of phlogiſticated alkaly. In many of its properties it much reſembles the calx of lead; and in others, the common calcareous earth, but ſtill ſeems ſufficiently different from that to conſtitute a new genus, as will appear from a little attention to the following circumſtances.

Terra ponderoſa,	Terra calcarea,
When diſſolved in water, precipitates upon the addition of the ſmalleſt portion of vitriolic acid.	Diſſolved in water, does not precipitate upon the addition of vitriolic acid.
Its gypſum, therefore, is inſoluble.	Its gypſum, therefore, is ſoluble.
With the nitrous and marine acid, forms cryſtals which do not deliqueſce.	With nitrous and marine acids forms ſalts ſo deliqueſcent that they cannot be kept in a cryſtallized form.
Decompoſes vitriolic ſalts *via humida*.	Does not decompoſe vitriolic ſalts.

It has been called terra ponderoſa, or heavy earth, upon account of the great ſpecific gravity of its gypſum; its ſpar is likewiſe heavy enough to countenance ſuch an appellation; but the earth itſelf does not appear to be a heavy ſubſtance, and I imagine the great weight of its compounds with the vitriolic and aërial acids is owing to the abſence of water.

Birmingham, Nov. 1783.